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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/056,610	01/24/2002	Joseph M. Brand	MIO 0051 V2	1537
7590	09/21/2004		EXAMINER	
Killworth, Gottman, Hagan & Schaeff, L.L.P. Suite 500 One Dayton Centre Dayton, OH 45402-2023			CHAMBLISS, ALONZO	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 09/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/056,610	BRAND, JOSEPH M.	
	Examiner	Art Unit	
	Alonzo Chambliss	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 30,32-34,40-45 and 50-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 30,32-34,40-45 and 50-53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/6/04 has been entered.

Response to Arguments

2. Applicant's arguments filed 1/22/04 have been fully considered but they are not persuasive.

Applicant alleges that Hegel fails to teach forming at least one void in the laminate so as to extend from one of the major faces through the electrically conductive layer and **into said underlying substrate, but not as far as said second major face**. This is deemed unpersuasive because the combination of Hegel and Juskey disclose at least one void in the laminate so as to extend from one of the major faces through the electrically conductive layer and into said underlying substrate, but not as far as said second major face, since the solder resist when attached to the laminate of Hegel would be over the conductive layer, so as to define a void portion over the void portion of the conductive layer and but not as far as the second major surface (see Fig. 4 of Hegel and Fig. 2 of Juskey).

Applicant alleges that Hegel and Juskey both fail to disclose **at least one continuous laminate layer and a void that does not extend the continuous laminate layer**. This is deemed unpersuasive because Hegel discloses at least one continuous laminate layer and a void that does not extend the continuous laminate layer. The portion of the laminate layer that extends from one void to the next, which is directly under the device 13, constitutes a continuous laminate (i.e. uninterrupted extension in space) (see Fig. 4). Therefore, this action is made **final**.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 30, 32-34, 40-45, 50, 52, and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hegel (U.S. 5,255,157) in view of Juskey et al. (U.S. 5,336,931).

With respect to Claim 30, 32, 40, and 53, Hegel discloses providing a semiconductor chip 13 and a laminate 10 defining first and second major faces, wherein the laminate 10 includes an electrically conductive layer, and an underlying substrate (i.e. the multi-layer structure) supporting the electrically conductive layer (see col. 2 lines 59-65; Fig. 4). At least one void 21 is in the laminate so as to extend from one of the major faces through the electrically conductive layer at least as far as the underlying

substrate. Encapsulating the semiconductor chip 13 and the laminate 10 with an encapsulant 16 such that the encapsulant 16 extends into the void 21 to contact the underlying substrate 10 (see col. 4 lines 1-26; Fig. 4). Hegel discloses a substrate 10 with a plurality of individual layers (i.e. first, second, third, and four laminate layers), wherein all of the layers have a void (i.e. cavity) that is over the void of the other plurality of layers. The plurality of individual layers is over one another. A conductive layer is over the fourth laminate, so as to define a void portion over the void 21 portion of the fourth laminate layer (see col. 2 lines 59-68; Fig. 4). Hegel discloses at least one continuous laminate layer and a void that does not extend the continuous laminate layer. The portion of the laminate layer that extends from one void to the next, which is directly under the device 13, constitutes a continuous laminate (i.e. uninterrupted extension in space) (see Fig. 4). Hegel fails to disclose at least one void in the laminate so as to extend from one of the major faces through the electrically conductive layer and into said underlying substrate, but not as far as said second major face and forming a solder resist layer over the conductive layer, so as to define a void portion over the void portion of the conductive layer. However, Juskey discloses at least one void in the laminate 160 so as to extend from one of the major faces and into said underlying substrate, but not as far as said second major face (i.e. continuous laminate layer that is at the bottom of the void) and forming a solder resist layer over the substrate 160, so as to define a void portion over the void portion. Thus, the solder resist when attached to the laminate of Hegel would be over the conductive layer, so as to define a void portion over the void portion of the conductive layer and but not as far as the second major

surface. Furthermore, it is well known the semiconductor industry to have a substrate having at least one resin layer as evident by Juskey (see col. 3 lines 20-25; Fig. 4). Therefore, it would have been obvious to incorporate the solder resist with the process of Hegel, since the solder resist would facilitate the formation of metal patterns on the laminate that are used as connection areas for bonding wires extending from the chip as taught by Juskey.

With respect to Claims 33, 41, and 42, Hegel discloses wherein the underlying cavity 21, the void 21 portion of the third laminate layer, the void 21 portion of the fourth laminate layer, the void portion 21 of the conductive layer taught by Hegel and the void portion 150 of the solder resist layer taught by Juskey are formed to collectively form a void (see Figs. 2 of Juskey and Fig. 4 of Hegel).

With respect to Claim 34, Juskey discloses placing a die 130 over at least a portion of the solder resist layer 180 and forming an encapsulant 110 over the solder resist layer 180, over the die 130, and in the void 150 (see Fig. 2).

With respect to Claim 43, Hegel discloses wherein the encapsulant 16 is formed in substantially the entire void 21 (see Fig. 4).

With respect to Claim 44, Juskey discloses wherein the at least one resin layer is formed from bismaleimide triazine laminate (see col. 3 lines 20-25).

With respect to Claim 50, Juskey discloses wherein the void 150 having a varying profile since the voids are not plated with metal (see col. 3 lines 43-55; Fig. 2).

With respect to Claim 52, Juskey disclose a void 150 with a varying profiled (see Fig. 2). The changing shape of the structure is an obvious matter of design choice within

ordinary skill in the art and a difference in the shape of the structure does not make the device operating differently. Note, the instant specification does not describe T-shaped profile as essential or critical or the only shape that could operate the claimed invention. In re Peters , 723 F.2d 891, 221 USPQ 952 (Fed. Cir. 1983). Therefore, it would have been obvious to incorporate a varying T-shaped profile as the void with Juskey, since the T-shaped profile would improve the attachment of the flow formed cover to the substrate as the varying void taught by Juskey.

5. Claims 45 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hegel (U.S. 5,255,157) and Juskey et al. (U.S. 5,336,931) as applied to claims 33 and 40 above, and further in view of Papathomas (U.S. 5,623,006) and Marrs et al. (U.S. 5,355,283).

With respect to Claim 45, Hegel-Juskey both fail to disclose wherein the at least one resin layer is formed from FR-4 epoxy-glass laminate. However, Papathomas discloses wherein the at least one resin layer is formed from FR-4 epoxy-glass laminate (see col. 8 lines 35-45). Therefore, it would have been obvious to substitute the FR-4 epoxy glass for the material of the laminate taught by Hegel-Juskey, since substrates made of FR-4 epoxy glass perform well at high temperatures as taught by Papathomas.

With respect to Claim 51, it is well known in the semiconductor industry to have a void having a varying profile that is formed by a process drilling as evident by Marrs (see col. 5 lines 3-8). Therefore, it would have been obvious to incorporate a void of varying profile formed by drilling with the process of Hegel-Juskey, since the drilling would facilitate process to create a void in a substrate as taught by Marrs.


The prior art made of record and not relied upon is cited primarily to show the process of the instant invention.

Conclusion

6. Any inquiry concerning the communication or earlier communications from the examiner should be directed to Alonzo Chambliss whose telephone number is (571) 272-1927.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-7956.

AC/September 19, 2004


Alonzo Chambliss
Primary Patent Examiner
Art Unit 2814